Consumption responses to COVID-19 payments: Evidence from a natural experiment and bank account data[☆]

So Kubota [a],[*], Koichiro Onishi [b], Yuta Toyama [a]

[a] *School of Political Science and Economics, Waseda University, 1-6-1 Nishi-Waseda, Tokyo, Japan*
[b] *School of Education, Waseda University, 1-6-1 Nishi-Waseda, Tokyo, Japan*

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ABSTRACT

We document households' spending responses to a stimulus payment in Japan during the COVID-19 pandemic. In response to the pandemic, the Japanese government launched a universal cash entitlement program offering a sizable lump sum of money to all residents to alleviate the financial burden of the pandemic on households. The timings of cash deposits varied substantially across households due to unexpected delays in administrative procedures. Using a unique panel of 2.8 million bank accounts, we find an immediate jump in spending during the week of payments, followed by moderately elevated levels of spending that persist for more than one month after payments are received. We also document sizable heterogeneity in consumption responses by recipients' financial status and demographic characteristics. In particular, demand deposit balances play a more crucial role than other financial asset holdings, suggesting the importance of the wealthy hand-to-mouth.

1. Introduction

The COVID-19 pandemic and the subsequent lockdowns have had severe impacts on household budgets around the world. A large number of studies have documented drastic declines in income, spending, and debt payments in various countries, including the United States (Baker et al., 2020a; Chetty et al., 2020; Coibion et al., 2020a; Cox et al., 2020), the United Kingdom (Hacioglu et al., 2020; Carvalho et al., 2020), Spain (García-Montalvo and Reynal-Querol, 2020), Sweden and Denmark (Sheridan et al., 2020), and Japan (Watanabe, 2020). Moreover, the pandemic shock disproportionately affected groups with certain socioeconomic backgrounds and from different sectors; for instance, those in the face-to-face service industry, those

with occupations that cannot be performed at home, low socioeconomic status households, minorities, women, youth, and parents were particularly susceptible (See, e.g., Forsythe et al. (2020); Alon et al. (2020); Montenovo et al. (2020) for the US; Blundell et al. (2020) for the UK; Kikuchi et al. (2020) for Japan; and Adams-Prassl et al. (2020) and Belot et al. (2020) for cross-country studies).

To mitigate economic shocks, governments worldwide have enacted urgent relief measures, primarily in the form of cash payments. Most OECD countries have introduced new systems for household cash transfers (OECD, 2020). These programs' extraordinary budgets and legislators' inclinations toward further stimulus call for a serious quantitative evaluation of COVID-19 cash transfer policies. These quantitative evaluations also provide implications for key macroeconomic variables, such as households' marginal propensities to consume (MPCs) and fiscal multipliers.

In this paper, we examine the *Special Cash Payment* program (hereafter, SCP)[1], a large-scale cash-transfer program launched by the Japanese government in response to the COVID-19 pandemic. The SCP program entails a fixed and sizable cash transfer amounting to 100,000 Japanese yen (JPY), which is approximately 950 US dollars, to every individual in Japan who applies regardless of age, income, family size, or employment. The payment policy provides a 'natural experiment' because the timing of payments was rendered nearly random due to the administrative overburdening that occurred at local offices. Our data reveal a continuous and bell-shaped distribution of payment days between the second week of May and the end of August 2020. Variations in the timing of payments allows us to estimate precisely the immediate effect of SCP payments on household spending within a brief temporal window. Our difference-in-difference approach allowed us to separate the effects of SCP payments from the effects of pandemic shocks, stay-at-home measures, and other policies.

We examine high-frequency transaction-level data for 2.8 million personal accounts at Mizuho Bank, one of Japan's three largest commercial banks, which recorded SCP payments during 2020. The dataset is a panel of bank accounts, containing information about the account balances, inflows to and outflows from the accounts, and basic demographic information about the account holders. We explore the heterogeneous effects on consumption of such demographic characteristics as account holders' income, income loss attributable to the pandemic, demand deposit balances, total financial asset holdings and liquidity constraints. Our main indicator of spending is total outflows, including cash withdrawals mainly through ATMs, transfers to other bank accounts, direct debit, and credit card charges. As a result, our estimates of MPC constitute an upper bound on household spending.[2]

The implied MPC is 0.49 within six weeks of receipt among all samples if consumption are to be measured by the total outflow. If we define cash withdrawal as a measure of consumption, the MPC is 0.31. Although this number is supposed to be higher than MPCs estimated by actual consumption, our estimates are comparable to those obtained from studies of the U.S. Coronavirus Aid, Relief, and Economic Security (CARES) Act.[3] Among dynamic responses, we observe an immediate jump in spending during the week of payments and, thereafter, a moderate increase that persists for more than one month after payments are received.[4] Our results indicate that the cash withdrawals constitute 63% of the total outflows, a reasonable percentage given that cash is the major payment method in Japan (Fujiki and Tanaka, 2018) and the SCP is one time payment.

We observe heterogeneity in MPCs across recipients' financial status and demographic characteristics. One substantial variation is caused by credit constraints. Recipients with binding credit constraints spend more (59%) of their SCP transfers. MPC hinges on the liquidity of assets. We find significant variation in MPCs by quartile of demand deposits, one of the most liquid assets. However, gross financial asset holdings make almost no difference in MPC. We also note a large MPCs among wealthy hand-to-mouth, who hold small demand deposit balances but extensive other financial assets. This result implies the crucial roles of the distributions over both liquid and illiquid asset holdings in fiscal and monetary policy analyses (Kaplan and Violante, 2014; Kaplan et al., 2018). An analysis of household income reveals a modestly large MPC (0.54) among households that suffered COVID-19-related losses exceeding 50% of their 2019 income. On the other hand, there is little variation in MPC across income quartiles. We also find that SCP exhibits a uniform effect across family size. Taken together, our results suggest both the potential improvements and limitations of targeting transfers when designing programs to stimulate consumption.[5]

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[1] We call this program *Special Fixed Benefit* in the pre-print version of this manuscript (Kubota et al., 2020).

[2] Evidence from the US COVID-19 stimulus package suggests this upper bound reasonably captures actual spending. Small differences appear between MPCs estimated by a consumption survey (Coibion et al., 2020b) and by total outflows from bank accounts (Karger and Rajan, 2020).

[3] Karger and Rajan (2020) and Misra et al. (2020) record MPCs of 0.50 and 0.43, respectively, using the financial transaction data from Facteus.

[4] The sustained increase in expenditure may be attributable to our large sample size. Previous evidence from Japan is unstable with regard to specifications and data. Shimizutani (2006) analyze the 1998 tax cut and report an MPC of 0.6 during its first month of implementation, but its effects nearly dissipate as shown by negative coefficients during the second month. Koga and Matsumura (2020) leverage a subjective question in the Survey of Household Finance and elicit a self-reported MPC of 0.73. However, they note a significant bias in self-reported data and find a more conservative MPC of 0.16 by tracking transitory income shocks in the Japan Household Panel Survey. Examining another type of cash transfer, Hsieh et al. (2010) found an MPC of 0.1 to 0.2 in concert with a shopping coupon policy implemented in 1999. Macroeconomists have supposed the recent Japanese MPC values to be low because of the small fiscal multipliers estimated from time-series analyses; for example, see Auerbach and Gorodnichenko (2017). Employing a quantitative macroeconomic model, Braun and Ikeda (2020) emphasize the role of the Japanese SCP policy during the current COVID-19 pandemic in mitigating consumption inequality.

[5] Indeed, stimulating aggregate consumption does not directly lead to welfare improvement. Nygaard et al. (2020) theoretically studies optimal policy design and find that the CARES Act would have improved social welfare by redistributing payments toward low-income and young recipients.

Related Literature. Our study adds to growing literature on the estimates of the MPCs from COVID-19 stimulus payments. One strand of the literature examines the US CARES Act. Baker et al. (2020b) use financial transaction data from fintech app users to derive an MPC spanning 0.25 to 0.35. Respondents to a survey by Coibion et al. (2020b) self-report an average MPC of approximately 0.4, although the MPC varies considerably across respondents' attributes, such as homeownership and liquidity constraints. Karger and Rajan (2020) use transaction-level data for debit cards from Facteus to calculate an average MPC of 0.5. They also note considerable heterogeneity in consumption responses that can be partially attributed to observable characteristics such as age, income, and location. Using regional variations in the timing of stimulus payments and zip code data from Facteus, Misra et al. (2020) record an average MPC of 0.43 during the initial four days after receiving a payment and decompose their results by product categories. Chetty et al. (2020) build a real-time zip code-level database of socio-economic variables obtained from private companies. They find significant jumps in consumer spending and business revenue around mid-April, which overlaps with payments from the CARES Act. Previous studies also estimate MPCs from the 2001 Economic Growth and Tax Relief Reconciliation Act and the 2008 Economic Stimulus Act in the US (Shapiro and Slemrod, 2003; Johnson et al., 2006; Agarwal et al., 2007; Shapiro and Slemrod, 2009; Parker et al., 2013; Broda and Parker, 2014; Misra and Surico, 2014).

A few studies have estimated COVID-19 cash transfer programs outside the US. Feldman and Heffetz (2020) conduct a survey about a similar one-time and universal COVID-19 cash transfer program in Israel. Although the amount of stimulus payment is small, many respondents use the stipend for paying down debts or purchases. Liu et al. (2020) study the effects of a temporary small-scale digital discount coupon intended to aid Chinese consumers during the COVID-19 crisis. Using transaction-level data from Alipay e-wallet, they observe strikingly high MPCs of 3.4 to 5.8, which they attribute to consumers' behavioral reactions. Kim and Lee (2020) examine a household consumption voucher initiative in South Korea, and find that most survey respondents planned to spend more on necessities.

Our study offers multiple contributions to the literature concerning stimulus payments and MPC, especially as they pertains to the COVID-19 pandemic. First, we exploit the random variations in the timings of payments in an difference-in-difference design. Second, our results can be easily interpreted due to the Japanese government's fixed payment scheme. Third, our use of high-frequency bank account data featuring millions of observations allow us to derive precise estimates. Fourth, our results accurately reflect personal MPCs because we observe the date of SCP receipts. These advantages are shared with the study of Kaneda et al. (2021) that follows our paper and evaluate the same Japanese cash transfer program using the same identification strategy. Instead of bank account data, they analyze user logs of a personal finance management software to refine our consumption measure. Kaneda et al. (2021) confirm our main results using different data and measures.

This study also ties into empirical studies that use bank account data to investigate the economic effects of the COVID-19 pandemic. Farrell et al. (2020) examine the effects of US unemployment insurance benefits using Chase bank account data, which shares characteristics with our data. The estimated MPC of unemployment insurance benefits (0.73) is reasonably comparable with our results for financially constrained households. Andersen et al. (2020) and Sheridan et al. (2020) analyze transaction-level customer data from Danske Bank in Scandinavia to evaluate the effects of the pandemic and the social distancing policies on consumer spending, with a focus on heterogeneity in individual characteristics and item categories. Carvalho et al. (2020) use transaction-level data from Banco Bilbao Vizcaya Argentaria (BBVA) to document changes in consumption during the pandemic and lockdown in Spain. Bounie et al. (2020) document a sharp rise in wealth inequality during the pandemic using randomly selected accounts at a French cooperative bank, Credit Mutuel Alliance Federale. This paper also measures the MPCs of back-to-school payments made under the COVID-19 crisis.

2. The COVID-19 pandemic and the SCP program in Japan

2.1. The COVID-19 crisis in Japan

The first COVID-19 case was reported on January 6, 2020, which is relatively early on compared with the timing of the first cases in other countries. The number of reported cases began to increase after January 28, as Japan faced shortages of masks and hand sanitizers. Several weeks into the pandemic, an outbreak occurred on the Diamond Princess cruise ship that resulted in 712 infections and 13 deaths. The spread of COVID-19 was substantially slower in Japan than in many other countries, but the number of cases in Japan still exhibited a pattern of exponential growth. To combat the rise in infections, the Japanese government mandated a temporary closure of all elementary, middle, and high schools on February 27. On March 24, Japan postponed the Tokyo 2020 Summer Olympics and Paralympics.

The number of cases rose rapidly after late March, given Japan's weak surveillance and limited capacity for PCR testing. The Japanese government announced its first state of emergency on April 7, for urban areas, then extended it nationwide on April 16. Unlike the stringent lockdown policies of other countries, Japan's announcement lacked legal binding forces. Nevertheless, the de-facto stay-at-home order reduced outings by 20% (Watanabe and Yabu, 2020).[6] The first-wave of the pandemic peaked around mid-April and was nearly contained by mid-May. The state of emergency was lifted selectively on

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[6] This paper finds that, among total 20% reduction of outing, 7% is due to the direct intervention effect of social and economic activities, while 13% is due to the announcement effect that reveals the current pandemic's situation.

May 14, and everywhere on May 25. Aggregate damage to public health in Japan was relatively minor: by May 25, Japan had reported a total of 16,706 cases and 846 deaths among its 126.5 million people.

The economic damage was substantial, however. In comparison with consumption in April and May of 2019, consumption in 2020 was 11.1% lower in April and 16.2% lower in May 2020, respectively, according to the Family Income and Expenditure Survey. The unemployment rate changed little because of Japan's entrenched employment protection, according to the labor force survey, but hours worked fell 3.9% in April and 9.3% in May. Wages of full-time workers dropped by 0.7% in April and 2.8% in May.

2.2. The special cash payment program

We evaluate the responses of household expenditures to the SCP policy, the largest COVID-19 relief program in Japan's first supplemental spending bill.[7] The program entitled all Japanese residents to a one-time payment without restrictions on age, income, family size, or nationality. The amount allocated per person was 100,000 Japanese JPY (approximately 950 USD), about 42% of the median monthly earned income of a full-time worker.

All Japanese households were notified by mail, and asked to apply online or by mail. The head of each household applied for benefits for all family members in the same residence. Applications required individual identification numbers of all family members and bank account information.[8] In households with more than one resident, all benefits were deposited into the head of household's bank account.[9]

The SCP program is unique and it is ideal for studying consumer responses to a one-time fiscal stimulus for two reasons. The SCP was the only universal, fixed-sum, and large-scale COVID-19 relief payment among advanced economies. According to OECD (2020), all other OECD countries imposed conditions on transfers (e.g., income eligibility thresholds or enrollment in social security).[10] Second, and more importantly, the payment date was nearly random within a range of several weeks because of administrative constraints. Local governments had to check each household's application and to send remittances to bank accounts manually.[11] Applications were primarily done by mail because online applications failed following technical difficulties. This led to an overflow of mailed applications and subsequent administrative errors. When such errors occurred, local offices had to correspond with applicants by phone or email to correct them. Some municipalities denied applications with incomplete entries or errors. For instance, 20% of applications in Saga city, a middle-sized municipality, had errors.[12]

News reports suggest that payment dates varied, depending upon cities' administrative capacities and the experience of office staff. Among large cities, Sapporo city had nearly completed remittances to all applicants by mid-June, while Nagoya city had not even finished sending applications to residents by this time.[13] In Tokyo prefecture, 85% of applicants living in Nerima ward received payments by June 30, whereas only 34.5% of residents in Edogawa Ward had received payments by then.[14] Even applicants from the same municipality received payments at different times. Applications submitted on the same day could result in differences in the timing of payments by several days.[15] A single error on an application could delay a payment by more than two weeks.[16] Such lack of uniformity in time-to-payment was unique among COVID-19 relief programs worldwide. For example, time-to-payment in the US differed only by whether payment was made by direct deposit or paper check (Baker et al. (2020b)).

3. Data and descriptive statistics

3.1. Data

Our data are account-level daily transactions from more than 24 million accounts at Mizuho Bank spanning January 2019 to August 2020. Data include transaction dates, payments and withdrawals, remarks about each transaction, and end-of-

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[7] Ando et al. (2020) summarize Japan's COVID-19 relief programs.

[8] Although applying was not mandatory, nearly all Japanese households applied. For instance, 98% of residents in Yokohama had applied for SCP by August 31, 2020. City of Yokohama webpage: https://www.city.yokohama.lg.jp/lang/covid-19-en/fixed-sum.html.

[9] Except in special cases, the SCP was received as direct deposits to bank accounts. Direct deposit is a popular money transfer method in Japan. According to the 2017 Global Findex Database of World Bank, 98% of Japanese hold bank accounts. In contrast, the use of personal checks is infrequent. According to the payments and financial market infrastructures statistics of the Bank for International Settlements, the total amount of payments made by checks was only 3% of the amount of bank transfers in Japan. In comparison, in the U.S., the amount of check payments composes 42% of total bank transfers. Coibion et al. (2020b) reported that 20% of households received the CARES Act payment by mailed checks.

[10] South Korea's universal COVID-19 financial relief program issued vouchers (Kim and Lee (2020)), but, the amount was small ($83 to $332 USD per person) and depended on household size and municipality of residence. Vouchers could be used only within a household's region of residence, except for bars, clubs, online stores, and large retailers. The CARES Act in the US was the only COVID-19 relief package comparable to Japan's SCP program (Baker et al., 2020b; Chetty et al., 2020; Coibion et al., 2020; Li et al., 2020; Misra et al., 2020). Amounts provided by CARES were large enough to detect consumer responses to the stimulus, but they were means-tested: a single person earning below 75,000 USD was entitled to the full amount (1200 USD), but higher-income households received substantially less. A similar income-payment scheme was applied to married couples. Each child was eligible for 500 USD.

[11] Individual identification numbers are not linked to bank accounts in Japan, unlike elsewhere (e.g., the US).

[12] Saga TV, *20% of Application Documents for 100,000 JPY Payment are Incomplete in Saga City, Saga Prefecture* (in Japanese), May 21, 2020. https://www.sagatv.co.jp/news/archives/2020052102735

[13] Nikkei news, '*Significant delay in 100,000 JPY benefit in Nagoya city: long time for system maintenance*' (in Japanese), June 26, 2020.

[14] J-CAST news, *What we ask the Governor of Tokyo is 'Quick transfer of 100,000 yen.'* (in Japanese), July 6, 2020.

[15] Some municipalities, including Edogawa ward, announced such cases in their web page.

[16] Saga TV, May 21, 2020.

Table 1
Summary statistics.

Panel A: Account level variables	N	Mean	St. Dev.	25%	Median	75%
Special Cash Payments (JPY)	2,832,537	204,125	118,615	100,000	200,000	300,000
Week of Deposit	2,832,537	26.913	2.778	25	27	29
Age	2,804,678	53.065	17.707	39.000	52.000	66.000
Female Dummy	2,809,140	0.258	0.438	0.000	0.000	1.000
Gross Financial Asset Holdings (JPY)	2,809,140	4,200,102	17,019,527	127,000	650,000	3,440,000
Demand-deposit Balance (JPY)	2,809,140	2,721,917	11,549,024	94,000	444,000	2,092,000
Monthly Salary in 2019 (JPY)	1,419,299	276,653	392,953	169,328	250,446	342,939
Monthly Salary in 2020 (JPY)	1,419,299	272,650	374,138	166,342	245,522	338,404
COVID-19 Shock Dummy 1	1,419,299	0.129	0.335	0.000	0.000	0.000
COVID-19 Shock Dummy 2	1,419,299	0.097	0.296	0.000	0.000	0.000
Liquidity Constraint Dummy	1,233,614	0.295	0.456	0.000	0.000	1.000
Panel B: Account-week Level Variables	N	Mean	St. Dev.	25%	Median	75%
Total Outflow in 2020 (JPY)	99,138,795	132,855	2,476,128	0	19,569	95,860
Cash Withdrawal in 2020 (JPY)	99,138,795	31,885	134,501	0	0	21,000

Notes: COVID-19 shock dummies 1 and 2 represent a 15%-50% and more than 50% decline in monthly salary in April and May 2020, respectively. The liquidity constraint dummy takes 1 if an end-of-month account balance was below the account holders' monthly income.

month balances. The data also identify some specific transactions (e.g., salary payments and cash withdrawals). We also have demographic information such as age, gender, and municipality level address. Data were de-identified for all account holders.

To examine how the SCP affected household consumption behaviors during the COVID-19 crisis, we restrict our sample to accounts that had received the payment by August 31. We identify those accounts through transaction remarks and deposit amounts.[17] The resulting sample of 2.8 million head-of-household accounts constitute 4.8% of all Japanese households. Although our sample size is abundant and rich in data, it represents only accounts at Mizuho Bank. Mizuho has branches throughout Japan, but accounts are concentrated in larger cities, especially around Tokyo. Therefore, our analysis may be biased to reflect the behavior of urban residents more.

3.2. Descriptive statistics

Table 1 presents summary statistics of our dataset. We drop the minimums and the maximums of all variables to maintain anonymity. Panel A summarises account-level variables. The average amount of SCP is approximately 200,000 JPY. This is because payments were fixed at 100,000 JPY per person, and there are, on average, two family members residing in each household of our sample. Each household's total asset is recorded as gross financial assets saved by Mizuho bank. This is the sum of (i) demand deposits, time deposits, and other banking accounts; (ii) public bonds; (iii) mutual funds; and (iv) life and non-life insurance balance, all in both JPY and foreign currencies. Our measure does not cover financial assets saved in other financial institutions. We also separate out information about the demand deposit balance, which is the most common bank account in Japan. The average holdings of gross financial assets in April 2020 is approximately 4.2 million JPY; demand-deposit balances (2.7 million JPY) comprised 65% of the gross financial assets. Table 1 also reports the head-of-household income, which averaged about 270,000 JPY in April and May 2019 and 2020. Notably, it slightly declined between 2019 and 2020. Note that the monthly salary is customarily deposited in employees' bank accounts in Japan.[18]

We construct two variables to measure financial distress from the COVID-19 crisis. The first variable (COVID-19 Shock Dummy 1) is a dummy that indicates whether account holders experienced a 15% to 50% declines in their monthly salary in April and May 2020 relative to those during the same months of 2019. This group includes employees placed on temporary leave.[19] Leave allowances usually equal 60% to 80% of salaries. The second variable (COVID-19 Shock Dummy 2) indicates declines in the monthly earned income exceeding 50%. As Japan's unemployment rate remained nearly unchanged, this variable captures self-employed workers whom the COVID-19 crisis damaged considerably. The Japanese government assisted small businesses whose revenues fell more than 50% from pre-crisis levels. Table 1 indicates that 12.9% of households experienced 15% to 50% declines in income and that 9.7% experienced declines exceeding 50% from the same months of the previous year.

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[17] We identify SCP receipts in two way: by remarks on accounts indicating an SCP deposit (*Teigaku* or *Kyufu* in Japanese) and by deposits that were exactly multiples of 100,000 JPY.

[18] Japan has implemented income-tax withholding; that is, companies pay income taxes and social security fees to the government office on behalf of workers. The amount of salary recorded in our data likely reflects the household head's monthly disposable income after those taxes and social security fees were deducted.

[19] Granting temporary leave has been Japanese companies' dominant response to COVID-19 because layoffs are difficult under Japan's employment protection. In response to the economic recession related to COVID-19, Japanese Government has proposed Employment Adjustment Subsidies for paying leave allowance.
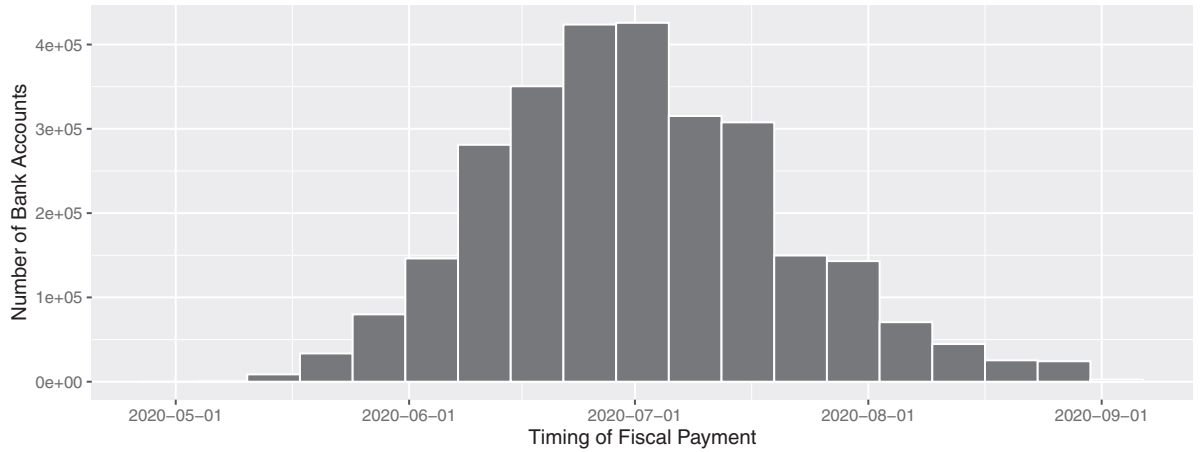
Fig. 1. Timing of SCP deposits.

The second variable is the liquidity constraint, which is defined as a condition of households who do not have enough wealth to smooth consumption between the days of salary payments.[20] Liquidity constrained households are likely to use more SCP to sustain their consumption level. To construct this variable, we first define the measure of net liquid assets, which is the sum of all bank deposits, public bonds, and mutual funds, minus card loan balances.[21] This definition is slightly different from those of Kaplan et al. (2014) and Hara et al. (2016) because we do not observe securities in the asset side and credit card balance on the debt side. Our dataset is limited to variables recorded by Mizuho bank. We then use net liquid asset to define the measure of liquid constraint as follows: our dummy variable of liquidity constraints takes a value of 1 if the next liquid asset balance at the end of the month before the SCP receipts is below the account holders' monthly income in the same month. About 29% of account holders are liquidity constrained, according to our definition.

Panel B of Table 1 presents summary statistics of weekly account total outflow and cash withdrawals as time-variant dependent variables of interest. Withdrawals include remittances to other bank accounts, for utilities and rent, and credit card payments. The mean (median) of weekly cash withdrawals is 132,855 JPY (19,569 JPY). The mean (median) of weekly cash withdrawals is 31,885 JPY (0 JPY), indicating that no cash was withdrawn from at least half of sampled accounts in any given week.

3.3. Timing of the SCP deposit

Figure 1 is a histogram of numbers of SCP receipts over the sampled period. The majority of transfers appear between late June and early July, the earliest appears in May, and the last appears during the final week of August. As Section 2.2 discussed, the administrative delays made the timing of payments unpredictable. We provide further support for this claim by regressing the week of households' SCP deposits while considering various demographic variables and geographic indicators in Appendix A.

4. Empirical strategy

To estimate the effects of SCP on household spending, we leverage weekly variations in the timing of SCP receipts across households in the following event study specification:

$$y_{itw} = \alpha_i + \alpha_{iw} + \alpha_{tw} + \sum_{k=a}^{b} \gamma^k D_{itw}^k + u_{itw}, \tag{1}$$

where y_{itw} is an outcome measure for bank account i in week $w(= 1, \ldots, 35)$ in year $t(= 2019, 2020)$. We use both cash withdrawal and total outflow per capita as a measure of household spending.[22] α_i denotes account-level fixed effects that

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[20] In Broda and Parker (2014)'s survey, the liquidity constraint is decided by the question: 'In case of an unexpected decline in income or increase in expenses, do you have at least two months of income available in cash, bank accounts, or easily accessible funds?' Coibion et al. (2020b) uses a similar question 'Suppose that you had to make an unexpected payment equal to one month of your after-tax income, would you have sufficient financial resources (access to credit, savings, loans from relatives or friends, etc.) to pay for the entire amount?'

[21] Card loans are casual personal loans adopted special cards issued by banks and other financial institutions. After loan card applications are once accepted, users can borrow money any time when they need it without putting up collateral or specifying loan usage. Users receive the loans by withdrawing cash from ATMs.

[22] We are able to infer household size from SCP amounts because each person receives 100,000 JPY.

capture time-invariant heterogeneity across households. α_{iw} are account-by-week fixed effects that control for seasonal patterns of consumption that are specific to each household. For instance, families with small children increase consumption significantly more than single-member households around Children's day in early May. α_{tw} are the year-by-week fixed effects that capture aggregate shocks and national policies. Later, we allow these time fixed effects to vary across regions (i.e., prefectures) to account for the potentially heterogeneous economic effects of COVID-19 across prefectures. u_{itw} is the idiosyncratic error.

The independent variable of interest is D_{itw}^k, where $D_{itw}^k = \mathbf{1}\{w - T_i = k\}$, and T_i denotes the week in which account i receives an SCP. Let $k \in [a, b]$ be the event-time relative to the week when households receive SCP. The week prior to the deposit corresponds to $k = -1$, and the week of payment is given by $k = 0$. We set $a = -5$ and $b = 5$ in our analysis. Coefficient γ^k (for $k >= 0$) captures household spending responses k-weeks after the SCP deposit. We also include the lead terms (for $k < 0$) to test for the presence of the pre-trends in the k weeks preceding the payment. We normalize the coefficient γ^{-1} to 0.

Estimating Eq. (1) directly using a within transformation is computationally intractable because of the enormous sample size, which amounts to approximately 200 million weekly-account cells spanning two years of transactions. Therefore, we begin by computing differences across observational years to eliminate fixed effects α_i and α_{iw} from Eq. (1). The resulting specification is as follows:

$$\Delta y_{iw} = \Delta \alpha_w + \sum_{k=a}^{b} \gamma^k D_{iw}^k + \Delta u_{iw}, \tag{2}$$

where $\Delta x_{iw} = x_{i,2020,w} - x_{i,2019,w}$ denotes changes in variable x from 2019 to 2020 within each unique bank account and week. We then employ ordinary least squares to estimate Eq. (2) and cluster the standard error at the prefectural level to account for the serial correlation across households and over time.

5. Estimation results

5.1. Results from the full sample

Table 2 reports estimation results of our event-study analysis. Results of full-sample regressions appear in Columns (1)–(4). The dependent variable in Columns (1) and (2) is total outflows from accounts in a given week. Columns (3) and (4) examine weekly cash withdrawals as the dependent variable. Columns (2) and (4) allows the time fixed effects to interact with prefecture fixed effects.

Households immediately increase total account outflows by approximately 19,000 JPY during the week they received SCP. Although the response is moderate in the weeks after the deposit, it remains sizable and statistically significant. We calculate our main MPC value according to the total out flow as 0.49 by summing up the coefficients within six weeks after the payment of Column (2). Columns (3) and (4) indicate that households withdraw 15,000 JPY in cash during the week of deposit, suggesting that spending responses are driven primarily by cash withdrawals. The MPC evaluated by cash withdrawal is 0.31, which is the sum of the coefficients within six weeks after the payment recorded in Column (4). The right and left panels of Fig. 2 plot the event study coefficients $\hat{\gamma}^k$ from Columns (2) and (4), respectively, in Table 2. This figure confirms a spike in withdrawals upon receiving SCP. Moderate but statistically significant positive coefficients of withdrawals persisted for five weeks.

The share of cash withdrawal is notably high. The cash withdrawal responding to SCP is about 31,000 out of 49,000 JPY in terms of total outflow within six weeks of the SCP receipt. The share of cash withdrawal is about 63%. This finding matches Japanese households' preference for cash over credit or debit cards for purchases. It is even larger than 49.8%, which is the average share of cash withdrawals in 2019 reported by the Japan Banker's Association.[23] This fact may imply that households are more likely to use the SCP for expenditures than monthly scheduled salary payments. We estimate a similar consumption response to the salary payments and report the results in Table B.5 and Fig. B.4 in the Appendix.[24] Within the two weeks after the salary payment, about 47.9% of total outflows is through cash withdrawal.[25] In general, direct debit and/or bank transfers include scheduled and almost fixed amount of payments, such as utility charges, room rents, insurance fees, mortgage loans. Because salary payments are also scheduled and nearly fixed, these regular transactions follow the salary payment each month. On the other hand, the SCP is unexpected in the short-run, it is irrelevant to these scheduled payments. Therefore, the direct debit and/or bank transfer responding to SCP payment become smaller as compared with cash withdrawal.

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[23] *The cashless paying out share* (Cashless ni yoru haraidashi hiritsu) https://www.zenginkyo.or.jp/stats/other-cashless/.

[24] The detailed method is as follows. We first construct a weekly panel of account inflow and outflow in January and February 2020. Next, we select a subsample of accounts that record salary deposit once in each month. This step possibly excludes the self-employed. Contrary to the SCP, we do not consider a difference in dependent variables between 2019 and 2020. This is because most account report almost the same amount of salary in both years, while the SCP is a unique transfer made only in 2020. Moreover, we do not normalized the coefficient at one week before the salary payment. Again, while the SCP is a one-time payment, salary is a repeated payment which is possibly used for consumption every week in a month.

[25] In Table B.5, this number is obtained as $0.479 = (0.161 + 0.40)/(0.282 + 0.259)$.

Table 2

Results from event study analysis.

| | Dependent Variables | | | | | | | | | | | | | | | | |
| | Total Outflows | | Cash Withdrawal | | Total Outflows | | | | | | | | | | | | |
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
5 weeks prior to payment	−3452	−3522	−152	−146	−6405	−1319	−2123	341	−76	−3741	4953	−490	−5034	−309	2299	−1351	−7388
	(1977)	(1933)	(79)	(73)	(3768)	(1310)	(954)	(1052)	(401)	(790)	(3336)	(769)	(2059)	(265)	(3137)	(1664)	(4642)
4 weeks prior to payment	955	879	−106	−135	2527	99	−2776	−2103	−262	−3198	2786	−831	1199	−1088	3612	−128	2812
	(1486)	(1502)	(67)	(67)	(2587)	(1431)	(978)	(938)	(704)	(1455)	(2158)	(790)	(1206)	(323)	(2890)	(651)	(3285)
3 weeks prior to payment	−587	−627	150	106	−1105	1961	−2710	−4511	54	−1568	2025	−558	290	−960	5275	−3230	−660
	(1179)	(1102)	(109)	(119)	(2559)	(2631)	(1363)	(708)	(693)	(1171)	(889)	(513)	(1152)	(288)	(2879)	(1318)	(2475)
2 weeks prior to payment	2648	2619	49	8	4174	1998	−338	−513	1041	2082	3594	−1468	1407	−184	6459	121	5307
	(1054)	(1128)	(92)	(99)	(2217)	(1881)	(1328)	(492)	(789)	(1042)	(3063)	(638)	(1776)	(176)	(3550)	(1328)	(2341)
Week of payment	19,190	19,050	15,100	15,096	16,418	18,030	21,281	21,393	16,946	18,906	26,918	33,757	13,738	28,675	19,502	9384	10,163
	(799)	(806)	(312)	(311)	(1433)	(2574)	(2523)	(529)	(726)	(1082)	(2835)	(800)	(1220)	(288)	(2500)	(1483)	(1280)
1 week after payment	11,708	11,534	8093	8126	12,206	9674	9914	11,040	12,753	9032	14,383	13,329	11,298	13,354	18,140	8606	8917
	(1550)	(1492)	(133)	(126)	(1826)	(557)	(3650)	(1405)	(1242)	(2007)	(2051)	(1350)	(2790)	(636)	(4264)	(1293)	(2196)
2 weeks after payment	5550	5416	3291	3323	5449	6028	4362	2759	6993	3503	5178	5232	5664	5321	−93	2964	6153
	(1371)	(1277)	(119)	(109)	(1653)	(1905)	(957)	(542)	(1205)	(927)	(3852)	(715)	(2420)	(153)	(1136)	(1541)	(2609)
3 weeks after payment	5064	5048	2022	2045	6399	2343	3021	4712	2370	3598	2693	2398	4171	3343	−36	3218	7225
	(930)	(1002)	(86)	(82)	(2286)	(756)	(1019)	(1095)	(762)	(2345)	(2570)	(553)	(1318)	(315)	(4778)	(1887)	(1948)
4 weeks after payment	2872	2778	1481	1498	2307	3497	2220	1686	2661	5263	3286	1147	3878	1701	5424	2415	3234
	(922)	(938)	(108)	(108)	(1497)	(1224)	(1085)	(668)	(616)	(2546)	(1200)	(1420)	(1340)	(450)	(1551)	(1765)	(1802)
5 weeks after payment	4942	4825	1159	1165	5797	6301	1523	3445	3800	2636	1678	−102	7401	1320	270	−1647	9213
	(1908)	(1892)	(89)	(92)	(2442)	(2790)	(726)	(801)	(1582)	(1492)	(1399)	(551)	(4108)	(263)	(3510)	(1309)	(3578)
Family Sizes					1	2	3	4									
COVID-19 Income Shocks									< 15%	15 − 50%	> 50%						
Liquidity Constraints												Yes	No				
Demand-Deposit Balance														Low	Low	High	High
Gross Financial Asset Holdings														Low	High	Low	High
Week FE	Yes		Yes														
Week*Prefecture FE		Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sample Size (millions)	98.1	98.1	98.1	98.1	44.3	23.3	15.4	11.8	30.0	5.1	3.1	11.8	30.1	44.0	5.1	5.0	44.0
MPC within 6 weeks	0.493	0.487	0.311	0.313	0.486	0.459	0.423	0.450	0.455	0.429	0.541	0.558	0.462	0.537	0.432	0.249	0.449

Notes: The standard errors are in parenthesis and clustered at prefecture level.
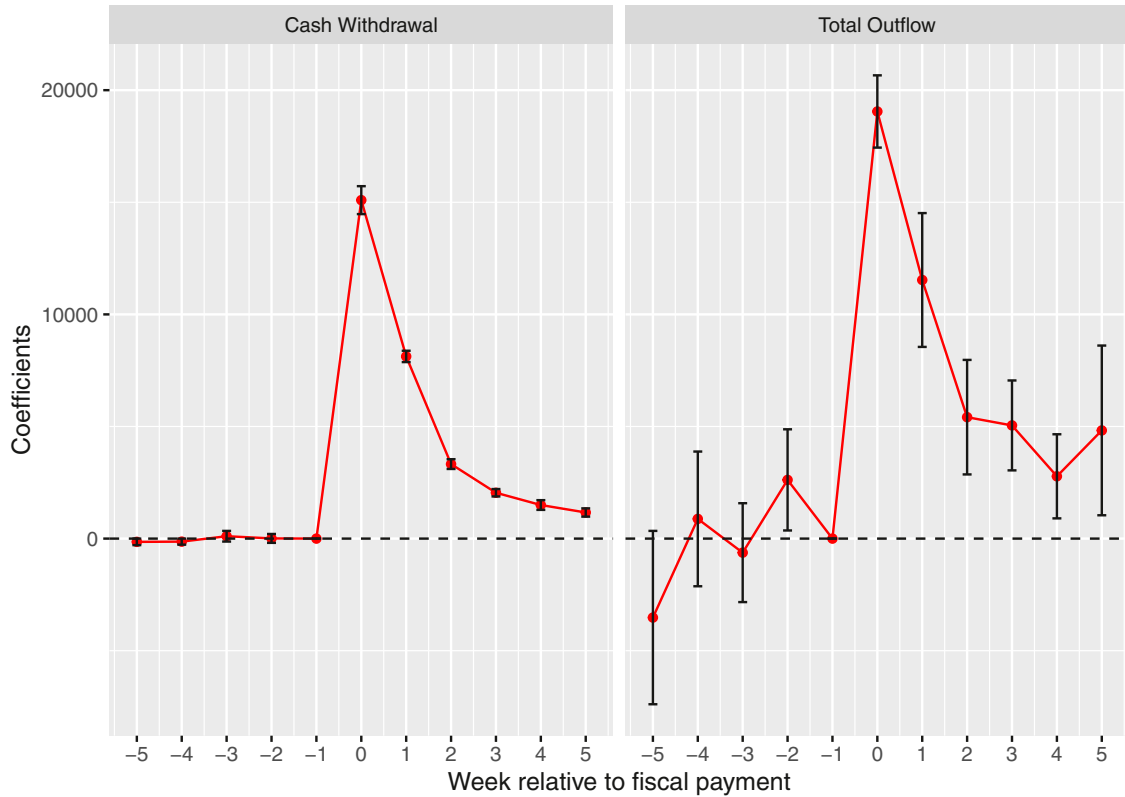
Fig. 2. Responses to SCP deposit (full sample). *Notes*: This figure plots the estimated coefficients $\hat{\gamma}^k$ for $k \in \{-5, \ldots, -1, 0, 1, \ldots, 5\}$. Estimates are taken from Columns (2) and (4) in Table 2. Note that γ^{-1} is normalized to 0. Bars indicate 95 percent confidence intervals. Standard errors are clustered at the prefectural level.

Discussion on Identifying Assumptions. A key identifying assumption in our event-study design is the parallel trend in withdrawal amounts between households that differ in the timing of SCP deposits. Although our assumption of a parallel trend is not directly testable, we provide supporting evidences.

First, we examine the lead coefficients in the event study design. Most of the coefficients before the receipt of SCP are statistically insignificant (right panel of Fig. 2) or precisely estimated as zero (left panel). These estimates imply an absence of any pre-trend in household consumption, suggesting that a parallel trend assumption is likely to hold. This finding aligns with our discussion in Section 3.3 and Appendix A on the plausible exogeneity of payment timings within a narrow time window.

Second, we investigate the robustness of our results by including week-by-prefecture fixed effects. The concern here is the correlation between the timing of SCP receipts and regional macroeconomic shocks, which arise from differing industry compositions and the spread of new coronavirus. Columns (1) and (3) in Table 2 control only for week fixed effects and Columns (2) and (4) account for week-by-prefecture fixed effects to address this concern. We are reassured that the magnitudes of our coefficients are statically and economically robust. Our discussions will be based on the results of week-by-prefecture fixed effects.

5.2. Heterogeneous impacts of fiscal payments

We explore heterogeneous responses in consumption to SCP by dividing account holders into sub-samples. Table 2 and Fig. 3 summarize the corresponding coefficients and standard errors of groups categorized by (a) family size, (b) COVID-19 income shocks, (c) liquidity constraints, and (d) demand deposit balances and gross financial asset holdings. In the Appendix, we report the results for the sub-samples defined by quartiles of demand-deposit balance (Table B.2 and Fig. B.1), gross financial asset holdings (Table B.3 and Fig. B.2), and monthly salary (Table B.4 and Fig. B.3), respectively. Hereafter we base our discussion on the specifications of total outflows as the dependent variable with control for prefecture-by-week fixed effects.

(a) Family Size

We first consider the heterogeneity in family size to check the validity of normalizing spending to a per-person amount. Family size is identified by the amount of SCP because the payment per person is fixed at 100,000 JPY. Regression results
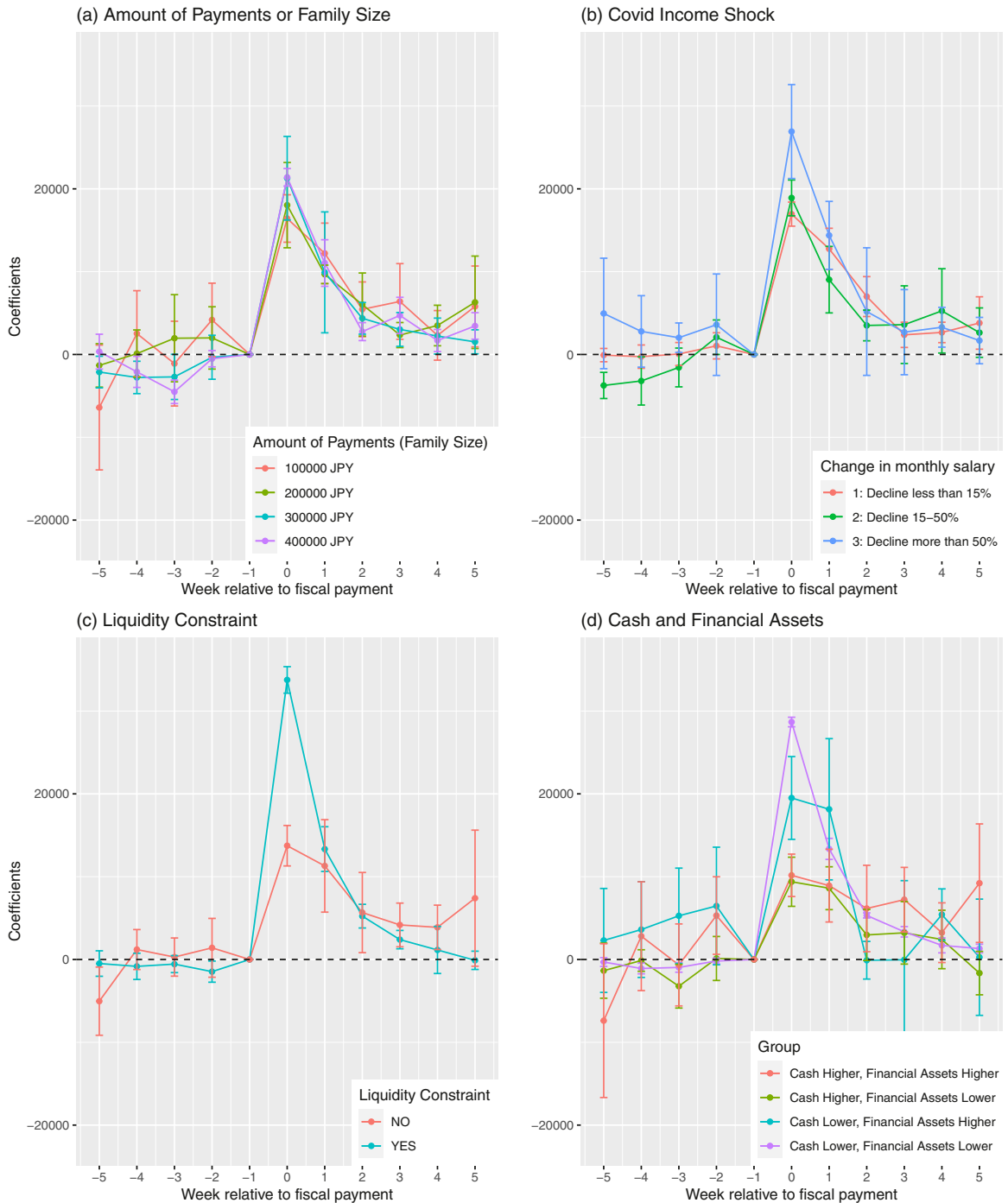
Fig. 3. Heterogeneous responses to SCP. *Notes*: This figure plots the estimated coefficients $\hat{\gamma}^k$ for $k \in \{-5, \ldots, -1, 0, 1, \ldots, 5\}$. Note that γ^{-1} is normalized to 0. Bars indicate 95 percent confidence intervals. Standard errors are clustered at the prefectural level.

for single-, two-, three- and four-person families are shown in Column (5), (6), (7), and (8), respectively, in Table 2. The coefficients and standard errors are also plotted in Panel (a) of Fig. 3. Larger families tended to respond slightly more during the week of the deposit, though there is not much difference in expenditure per person.[26]

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[26] Our bank account data do not have detailed information about family structure such as the number of children.

(b) Income Shock Attributable to the COVID-19 Crisis

We show how the income shock attributable to the COVID-19 pandemic affects responses to SCP deposits. Columns (9) and (10) in Table 2 presents results for account holders whose monthly income fell by less than 15% and by between 15% and 50%, respectively. Column (11) presents coefficients of groups that experienced drops of 50% or larger. Coefficients and standard errors appear in Panel (b) of Fig. 3. The most seriously affected group has a modestly higher MPC. However, differences among the three groups are unclear. That may be partly because the Japanese government's COVID-19 fiscal package includes temporary leave benefits, which likely stabilize jobs and benefit small businesses by compensating for significant income loss among the self-employed.

(c) Liquidity Constraint

Columns (12) and (13) in Table 3 and Panel (c) of Fig. 3 show differential responses to SCP by liquidity-constrained households and others, respectively. We observe a higher spike among the former during the week of payments. Households not constrained by liquidity react moderately but sustain more spending during the second to fifth weeks after the receipts of SCP. These findings might be because liquidity-constrained households need cash for daily living, whereas other households may buy non-necessities without rushing. Standard errors for the former group are small after the payment, showing that households facing liquidity constraints react homogeneously to the receipts of SCP.[27]

(d) Wealthy Hand-to-mouth

Another dimension of household heterogeneity is the joint distribution of liquid and illiquid assets. Columns (14)(17) of Table 3 and Panel (d) of Fig. 3 display the consumption responses by high/low gross financial asset holdings and demand deposit balance.[28] The demand deposit balance is the main factor to differentiate the short-term responses. Columns (14) and (15) in Table 3 show that groups of more cash holdings exhibit substantially high coefficients in the week of the payments and one week after that. On the other hand, Columns (16) and (17) indicate relatively lower MPCs of households with fewer cash savings. However, the effects of the gross financial asset holdings are limited. There are relatively small differences in the coefficients in the week of the payments and one week after that between Columns (14) and (15), and also between Columns (16) and (17).

Column (15) represents the MPCs of the 'wealthy hand-to-mouth.' Those households likely require cash for daily transactions, while they hold sufficient gross financial asset holdings. Our results of high MPCs among the wealthy hand-to-mouth are in accordance with the theoretical implications suggested by Kaplan and Violante (2014) and Kaplan et al. (2018).

6. Conclusion

This study examines households' responses to a large-scale and universal cash payment program in response to the COVID-19 pandemic in Japan. We obtain causal estimates under a natural experimental design created by randomized timings of cash transfers. Moreover, high-resolution bank account data help to deliver precise and robust results. We find a sizable MPC and significant heterogeneity in financial status.

For future research, we would like to extend our analysis by deepening heterogeneity in MPCs to derive the implications of input-output linkage in the current COVID-19 crisis. Unlike past recessions characterized by macroeconomic demand/supply shocks, the current crisis is characterized with heterogeneous sector-level shocks (del Rio-Chanona et al., 2020), particularly concentrated in the face-to-face service industry. This heterogeneity might amplify these shocks through input-output links among industry networks (Baqaee and Farhi, 2020). Household MPCs might also be biased toward non-services. Guerrieri et al. (2020) theoretically predict that such a biased consumption pattern significantly reduces the multiplier effects of fiscal policies. Although face-to-face service workers supposedly have higher MPCs, they earn less from consumer spending stimulated by cash transfers. These secondary or higher-round effects are crucial policy considerations warranting further study. Multiplier effects throughout economic networks could be discerned by estimating MPCs according to worker's occupation/industry and by items consumed. To investigate these issues, we intend to identify worker information from their bank accounts and decompose expenditures into categories by linking our dataset with credit card data.

Declaration of Competing Interest

The author (So Kubota) declares that he has no relevant or material financial interests that relate to the research described in the paper titled 'Consumption Responses to COVID-19 Payments: Evidence from a Natural Experiment and Bank Account Data'.

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[27] Theoretically, the liquidity constraint should be associated with the availability of borrowing. If a household gets mortgage loan from Mizuho bank, it may have limited access to further loan. We conduct the same exercise with subgroups differentiated by mortgage debt status but find almost no change in the result.

[28] Due to the limited information about assets, the interpretation of our result is slightly different from the literature. We interpret the demand deposit balance as liquid assets, and the gross financial asset holdings as the illiquid assets. However, our definition of gross financial asset holdings also include time deposits, bond holdings, and mutual funds. They are classified as liquid assets by Kaplan et al. (2014) and Hara et al. (2016). Hence, it may be better to interpret the gross financial asset holdings as mixed liquidity assets. Moreover, demand deposit is super-liquid assets relative to others. In this sense, we analyze the difference between super-liquid asset and mixed liquidity assets. However, we believe that our exercise is in line with the literature because we evaluate the difference in liquidity. It is also noted that we use only gross measure, due to the lack of information about liquid and illiquid debts.

The author (Koichiro Onishi) declares that he has no relevant or material financial interests that relate to the research described in the paper titled 'Consumption Responses to COVID-19 Payments: Evidence from a Natural Experiment and Bank Account Data'.

The author (Yuta Toyama) declares that he has no relevant or material financial interests that relate to the research described in the paper titled 'Consumption Responses to COVID-19 Payments: Evidence from a Natural Experiment and Bank Account Data'.

Appendix A. Additional Discussion about Timing of SCP deposits

As discussed in Section 2.2, the timing of SCP receipts was driven by the administrative delays and can be regarded as unpredictable. This Appendix supports that claim by regressing the week of SCP deposits against demographic variables and geographic indicators.

Specifically, the dependent variable is the week in which a bank account receives an SCP. Independent variables include age, a female dummy, gross financial asset holdings, demand deposits, COVID-19 shock indicators, and a dummy for liquidity constraint. We also add prefecture dummies and municipality indicators in some specifications.[29]

Estimation results for the timing of payments appear in Table A.1. Columns (1) and (4) are the specifications without geographic dummies, Columns (2) and (5) include prefecture dummies, and columns (3) and (6) add municipality dummies. The R-squared values are 0.027 and 0.083, respectively, in Columns (1) and (2). With municipality dummies, the R-squared reaches 0.29. While geography predicts timings of payments to some extent, there remains substantial variation in timing that is not explained by geography.

Turning to demographic variables, coefficients are estimated precisely given the large sample size. However, the magnitudes of these coefficients are small and correlate weakly with the timing of SCP deposits. For example, an account holder 10 years older than the average individual will receive an SCP only 0.1 weeks earlier. As such, our analysis suggests that the account holders' region of residence drives the timing of SCP receipts. Little statistical evidence suggests households endogenously manipulate the timing of payments.

Table A.1
Correlation between timing of payments and demographic variables.

	Dependent variable:					
	The week of deposit					
	(1)	(2)	(3)	(4)	(5)	(6)
Age	−0.013	−0.016	−0.015	−0.011	−0.016	−0.015
	(0.002)	(0.003)	(0.002)	(0.001)	(0.003)	(0.002)
Female	0.344	0.282	0.258	0.332	0.255	0.243
	(0.030)	(0.013)	(0.013)	(0.056)	(0.029)	(0.019)
Gross financial asset	0.00001	0.00001	0.00001	−0.00001	−0.00000	−0.00000
	(0.00001)	(0.00000)	(0.00000)	(0.00001)	(0.00000)	(0.00000)
Demand deposit	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
	(0.00003)	(0.00002)	(0.00002)	(0.00001)	(0.00001)	(0.00001)
Family size	−0.257	−0.277	−0.272	−0.125	−0.146	−0.141
	(0.020)	(0.014)	(0.013)	(0.020)	(0.013)	(0.011)
Monthly salary in 2019				0.002	0.001	0.001
				(0.0004)	(0.0002)	(0.0001)
COVID19 shock 1				−0.102	−0.099	−0.088
				(0.011)	(0.012)	(0.005)
COVID19 shock 2				−0.115	−0.118	−0.152
				(0.014)	(0.020)	(0.015)
Liquidity constraint				−0.577	−0.576	−0.512
				(0.017)	(0.013)	(0.012)
Constant	28.033			27.417		
	(0.130)			(0.157)		
Observations	2,798,149	2,798,149	2,798,149	1,194,378	1,194,378	1,194,378
R[2]	0.027	0.083	0.286	0.026	0.092	0.306
Prefecture FE		Yes			Yes	
Municipality FE			Yes			Yes

Notes: The dependent variable is the week in which a bank account receives the fiscal payment per person. Independent variables include age, a female dummy, gross financial asset holdings, demand deposit, an SCP dummy, COVID-19 shock indicators, and a dummy for liquidity constraint. Columns (1) and (4) are specifications without geographic dummies. Columns (2) and (5) include prefecture dummies. Columns (3) and (6) add municipality dummies. The unit of gross financial asset holdings and amounts of SCP are 10,000 JPY. Standard errors are in parenthesis and clustered at prefecture level.

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[29] The prefecture is Japan's largest unit of local government. There are 47 prefectures in total. Municipalities are the lower unit of local government in each prefecture. The total number of municipalities is 1741 as of October 1, 2018

Appendix B. Additional Tables and Figures

Table B.2
Regression results by quartile of savings in demand-deposit accounts.

	1st	2nd	3rd	4th
5 weeks prior to payment	−246	103	−1051	−12,450
	(760)	(397)	(955)	(8063)
4 weeks prior to payment	−293	−976	122	4969
	(711)	(810)	(598)	(5869)
3 weeks prior to payment	527	−1254	1014	−2862
	(612)	(570)	(615)	(4493)
2 weeks prior to payment	987	−63	433	9130
	(300)	(431)	(572)	(4124)
Week of Payment	36,816	18,587	12,110	8022
	(219)	(626)	(861)	(2653)
1 week after payment	16,301	11,256	7911	9804
	(1089)	(763)	(1462)	(3946)
2 weeks after payment	5879	3513	1736	9912
	(324)	(296)	(930)	(4268)
3 weeks after payment	3136	2719	3004	10,585
	(940)	(724)	(842)	(3359)
4 weeks after payment	3162	870	2185	4074
	(278)	(698)	(788)	(2888)
5 weeks after payment	2041	265	2578	13,653
	(234)	(1174)	(895)	(5674)
Sample Size	24,409,070	24,624,880	24,527,545	24,521,210
Week FE				
Week*Prefecture FE	Yes	Yes	Yes	Yes

Notes: Standard errors are clustered at prefectural level.

Table B.3
Regression results by quartiles of gross financial asset holdings.

	1st	2nd	3rd	4th
5 weeks prior to payment	−1145	351	−181	−12,798
	(189)	(564)	(454)	(7560)
4 weeks prior to payment	44	−2003	−711	6323
	(644)	(972)	(835)	(5536)
3 weeks prior to payment	−844	−1547	2295	−2478
	(198)	(524)	(683)	(4454)
2 weeks prior to payment	−116	−210	468	10,340
	(253)	(439)	(438)	(4493)
Week of Payment	36,248	17,094	12,558	9606
	(259)	(525)	(593)	(2741)
1 week after payment	15,099	10,524	7131	12,516
	(465)	(865)	(669)	(4467)
2 weeks after payment	6418	3642	4263	6638
	(172)	(406)	(1957)	(3134)
3 weeks after payment	3694	2891	2896	9958
	(186)	(452)	(1422)	(3317)
4 weeks after payment	2063	1385	3514	3437
	(412)	(550)	(413)	(3168)
5 weeks after payment	1043	923	2266	14,288
	(220)	(517)	(919)	(6259)
Sample Size	24,462,550	24,540,670	24,540,495	24,540,880
Week FE				
Week*Prefecture FE	Yes	Yes	Yes	Yes

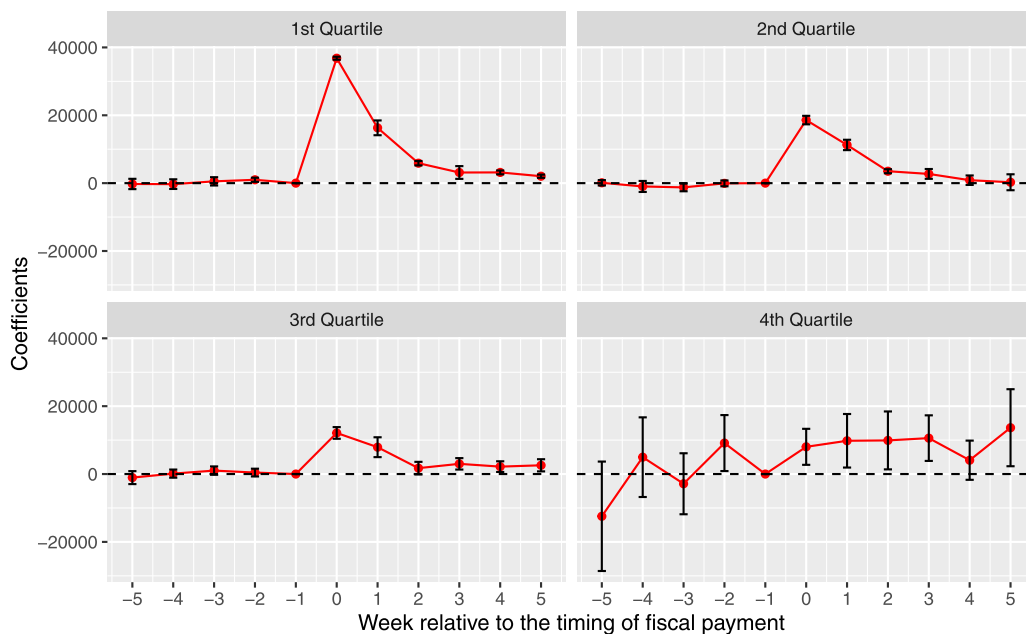*Notes*: Standard errors are clustered at prefectural level.

Fig. B.1. Heterogeneous responses to SCP by quartile of savings in demand-deposit accounts. *Notes*: The figure plots estimated coefficients of $\hat{\gamma}^k$ for $k \in \{-5, \ldots, -1, 0, 1, \ldots, 5\}$. Note that γ^{-1} is normalized to 0. The bars indicate 95 percent confidence intervals. Standard errors are clustered at prefectural level.
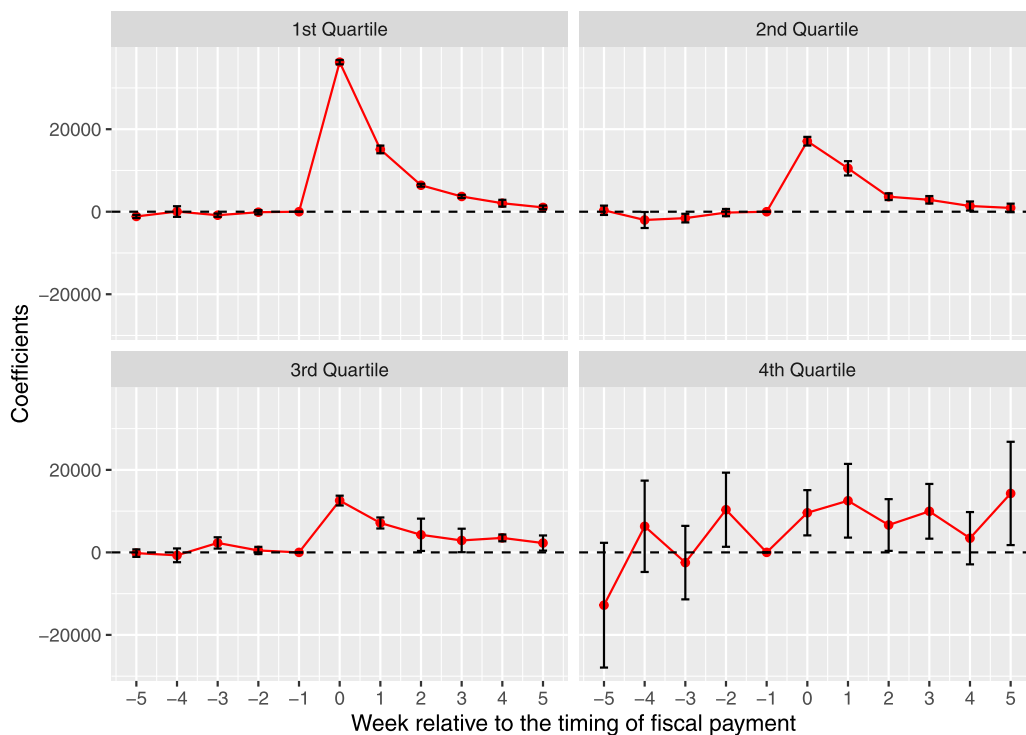

Fig. B.2. Heterogeneous responses to SCP by quartile of gross financial asset holdings. *Notes*: The figure plots estimated coefficients of $\hat{\gamma}^k$ for $k \in \{-5, \ldots, -1, 0, 1, \ldots, 5\}$. Note that γ^{-1} is normalized to 0. The bars indicate 95 percent confidence intervals. Standard errors are clustered at prefectural level.

Table B.4
Regression results by quartile of monthly salary.

	1st	2nd	3rd	4th
5 weeks prior to Payment	−2567	−169	1422	554
	(516)	(890)	(1140)	(887)
4 weeks prior to Payment	−16	778	−1846	−433
	(1749)	(492)	(1122)	(1219)
3 weeks prior to Payment	116	−3527	1818	1924
	(620)	(2819)	(1239)	(2401)
2 weeks prior to Payment	2023	2041	−0	2011
	(1383)	(579)	(1158)	(2641)
Week of Payment	19986	19067	17032	16577
	(1796)	(817)	(1145)	(2427)
1 week after payment	10248	10095	9121	20393
	(983)	(616)	(536)	(4366)
2 weeks after payment	5916	5585	5608	8867
	(1018)	(955)	(1820)	(3177)
3 weeks after payment	2918	3003	1731	2712
	(819)	(1107)	(864)	(1904)
4 weeks after payment	3415	2260	1342	5418
	(716)	(744)	(735)	(2071)
5 weeks after payment	−767	4584	180	9428
	(1654)	(739)	(783)	(5559)
Sample Size	8071630	10098095	10372390	9611980
Week FE				
Week*Prefecture FE	Yes	Yes	Yes	Yes

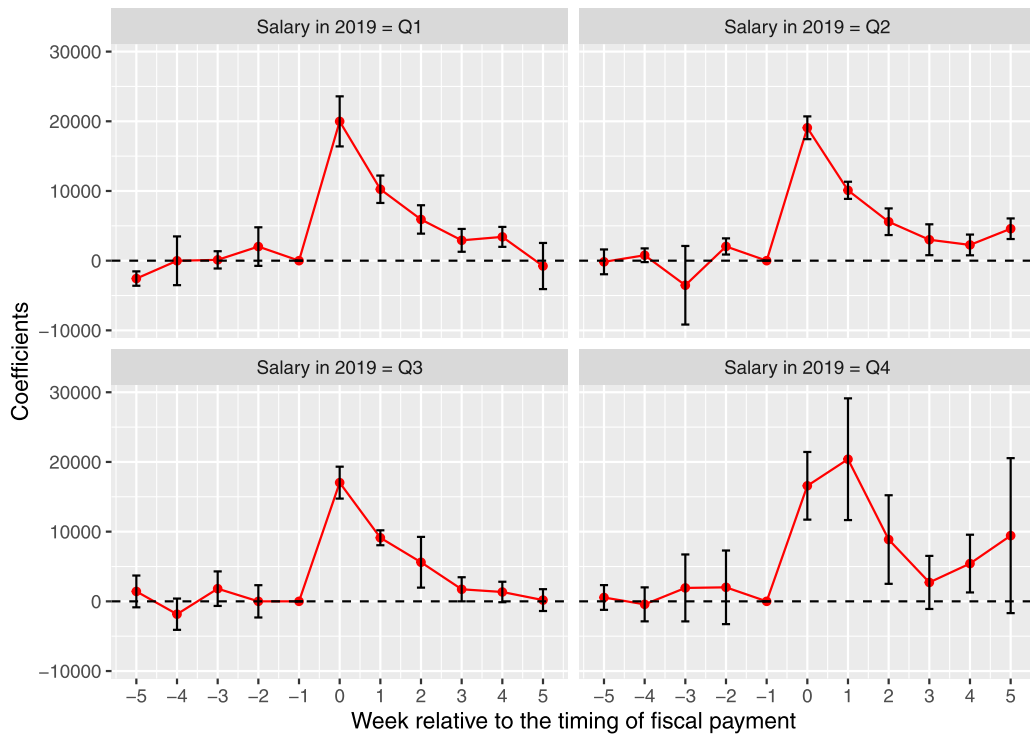*Notes*: Standard errors are clustered at prefectural level.

Fig. B.3. Heterogeneous responses to SCP by quartile of monthly salary. *Notes*: The figure plots estimated coefficients of $\hat{\gamma}^k$ for $k \in \{-5, \ldots, -1, 0, 1, \ldots, 5\}$. Note that γ^{-1} is normalized to 0. The bars indicate 95 percent confidence intervals. Standard errors are clustered at prefectural level.

Table B.5
Account outflow after salary payment.

	All Outflow	Cash withdrawal
The week of salary payment	0.282	0.161
	(0.140)	(0.035)
1 week after salary payment	0.259	0.040
	(0.075)	(0.035)
2 weeks after salary payment	−0.028	−0.054
	(0.119)	(0.098)
3 weeks after salary payment	0.010	0.064
	(0.075)	(0.066)
Sample Size	10856269	10856269
Week*Prefecture FE	Yes	Yes

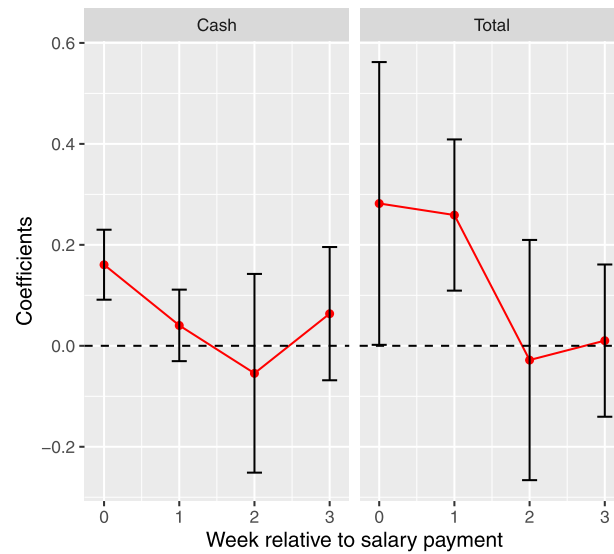*Notes*: Standard errors are clustered at prefectural level.

Fig. B.4. Account outflow after salary payment. *Notes*: The figure plots estimated coefficients of $\hat{\gamma}^k$ for $k \in \{0, 1, \ldots, 4\}$, where the week of salary payment is $k = 0$. Since this is not a one-time transitory shock, we do not normalize so that $\gamma^{-1} = 0$. The bars indicate 95 percent confidence intervals. Standard errors are clustered at prefectural level.

References

Adams-Prassl, A., Boneva, T., Golin, M., Rauh, C., 2020. Inequality in the impact of the coronavirus shock: evidence from real time surveys. J. Public Econ. 189.

Agarwal, S., Liu, C., Souleles, N.S., 2007. The reaction of consumer spending and debt to tax rebates–evidence from consumer credit data. J. Polit. Economy 115 (6), 986–1019.

Alon, T., Doepke, M., Olmstead-Rumsey, J., Tertilt, M., 2020. The impact of COVID-19 on gender equality. Covid Econ. 4, 62–85.

Andersen, A., Hansen, E.T., Johannesen, N., Sheridan, A., 2020. Consumer responses to the COVID-19 crisis: evidence from bank account transaction data. Covid Econ. 7, 92–118.

Ando, M., Furukawa, C., Nakata, D., Sumiya, K., 2020. Fiscal responses to the COVID-19 crisis in japan: the first six months. Natl. Tax J. 73 (3), 901–926D.

Auerbach, A.J., Gorodnichenko, Y., 2017. Fiscal multipliers in Japan. Res. Econ. 71 (3), 411–421.

Baker, S.R., Farrokhnia, R.A., Meyer, S., Pagel, M., Yannelis, C., 2020. How does household spending respond to an epidemic? Consumption during the 2020 COVID-19 pandemic. Rev. Asset Pricing Stud. 10 (4), 834–862.

Baker, S.R., Farrokhnia, R.A., Meyer, S., Pagel, M., Yannelis, C., 2020. Income, Liquidity, and the Consumption Response to the 2020 Economic Stimulus Payments. NBER Working Paper Series No. 27097.

Baqaee, D., Farhi, E., 2020. Nonlinear Production Networks with an Application to the COVID-19 Crisis. NBER Working Paper Series No. 27281.

Belot, M., Choi, S., Tripodi, E., van den Broek-Altenburg, E., Jamison, J.C., Papageorge, N.W., 2020. Unequal consequences of COVID 19 across age and income: representative evidence from six countries. Covid Econ. 38, 196–217.

Blundell, R., Costa Dias, M., Joyce, R., Xu, X., 2020. COVID-19 and inequalities. Fisc. Stud. 41 (2), 291–319.

Bounie, D., Camara, Y., Fize, E., Galbraith, J., Landais, C., Lavest, C., Pazem, T., Savatier, B., et al., 2020. Consumption dynamics in the covid crisis: real time insights from French transaction & bank data. Covid Econ. 59, 1–39.

Braun, R.A., Ikeda, D., 2020. Why Cash Transfers Are Good Policy in the COVID-19 Pandemic. Federal Reserve Bank of Atlanta's Policy Hub No.04-202.

Broda, C., Parker, J.A., 2014. The economic stimulus payments of 2008 and the aggregate demand for consumption. J. Monet. Econ. 68, S20–S36.

Carvalho, V.M., Hansen, S., Ortiz, A., Garcia, J.R., Rodrigo, T., Rodriguez Mora, S., Ruiz de Aguirre, P., 2020. Tracking the COVID-19 Crisis with High-Resolution Transaction Data. CEPR Discussion Paper Series No. DP14642.

Chetty, R., Friedman, J.N., Hendren, N., Stepner, M., 2020. How Did COVID-19 and Stabilization Policies Affect Spending and Employment? A New Real-Time Economic Tracker Based on Private Sector Data. NBER Working Paper Series No.27431.

Coibion, O., Gorodnichenko, Y., Weber, M., 2020. The cost of the COVID-19 crisis: lockdowns, macroeconomic expectations, and consumer spending. Covid Econ. 20, 1–51.

Coibion, O., Gorodnichenko, Y., Weber, M., 2020. How Did US Consumers Use Their Stimulus Payments? NBER Working Paper Series No.27693.

Cox, N., Ganong, P., Noel, P., Vavra, J., Wong, A., Farrell, D., Greig, F., 2020. Initial impacts of the pandemic on consumer behavior: evidence from linked income, spending, and savings data. Brookings Pap. Econ. Act..

Farrell, D., Ganong, P., Greig, F., Liebeskind, M., Noel, P., Vavra, J., 2020. Consumption effects of unemployment insurance during the COVID-19 pandemic. Available at SSRN 3654274: https://ssrn.com/abstract=3654274.

Feldman, N., Heffetz, O., 2020. A Grant to Every Citizen: Survey Evidence of the Impact of a Direct Government Payment in Israel. NBER Working Paper Series No. 28312.

Forsythe, E., Kahn, L.B., Lange, F., Wiczer, D., 2020. Labor demand in the time of COVID-19: evidence from vacancy postings and UI claims. J. Public Econ. 189 (104238).

Fujiki, H., Tanaka, M., 2018. How do we choose to pay using evolving retail payment technologies? Evidence from Japan. J. Jpn. Int. Econ. 49, 85–99.

García-Montalvo, J., Reynal-Querol, M., 2020. Distributional Effects of COVID-19 on Spending: A First Look at the Evidence from Spain. Economic Working Paper Series No. 1740.

Guerrieri, V., Lorenzoni, G., Straub, L., Werning, I., 2020. Macroeconomic Implications of COVID-19: Can Negative Supply Shocks Cause Demand Shortages? NBER Working Paper Series No. 26918.

Hacioglu, S., Känzig, D., Surico, P., 2020. The Distributional Impact of the Pandemic. CEPR Discussion Paper Series No. DP15101.

Hara, R., Unayama, T., Weidner, J., 2016. The wealthy hand to mouth in Japan. Econ. Lett. 141, 52–54.

Hsieh, C.-T., Shimizutani, S., Hori, M., 2010. Did Japan's shopping coupon program increase spending? J. Public Econ. 94 (7–8), 523–529.

Johnson, D.S., Parker, J.A., Souleles, N.S., 2006. Household expenditure and the income tax rebates of 2001. Am. Econ. Rev. 96 (5), 1589–1610.

Kaneda, M., Kubota, S., Tanaka, S., 2021. Who spent their COVID-19 stimulus payment? Evidence from personal finance software in Japan. Covid Econ. 75, 1–29.

Kaplan, G., Moll, B., Violante, G.L., 2018. Monetary policy according to hank. Am. Econ. Rev. 108 (3), 697–743.

Kaplan, G., Violante, G.L., 2014. A model of the consumption response to fiscal stimulus payments. Econometrica 82 (4), 1199–1239.

Kaplan, G., Violante, G.L., Weidner, J., 2014. The wealthy hand-to-mouth. Brookings Pap. Econ. Act. 139–153.

Karger, E., Rajan, A., 2020. Heterogeneity in the Marginal Propensity to Consume: Evidence from COVID-19 Stimulus Payments. FRB of Chicago Working Paper Series WP2020-15.

Kikuchi, S., Kitao, S., Mikoshiba, M., 2020. Who suffers from the COVID-19 shocks? Labor market heterogeneity and welfare consequences in Japan. Covid Econ. 40, 76–114.

Kim, M.J., Lee, S., 2020. Can Stimulus Checks Boost an Economy under COVID-19? Evidence from South Korea. IZA Discussion Papers Series No.13567.

Koga, M., Matsumura, K., 2020. Marginal Propensity to Consume and the Housing Choice. Bank of Japan Working Paper Series No.20-E-3.

Kubota, S., Onishi, K., Toyama, Y., 2020. Consumption responses to COVID-19 payments: evidence from a natural experiment and bank account data. Covid Econ. 62, 90–123.

Li, K., Foutz, N. Z., Cai, Y., Liang, Y., Gao, S., 2020. The impact of COVID-19 lockdowns and stimulus payments on spending of us lower-income consumers. Available at SSRN 3681629: https://ssrn.com/abstract=3681629.

Liu, Q., Shen, Q., Li, Z., Chen, S., 2020. Stimulating consumption at low budget–evidence from a large-scale policy experiment amid the COVID-19 pandemic. Available at SSRN 3626518: https://ssrn.com/abstract=3626518.

Misra, K., Singh, V., Zhang, Q., 2020. Impact of the cares act stimulus payments on consumption. Available at SSRN 3663493: https://ssrn.com/abstract=3663493.

Misra, K., Surico, P., 2014. Consumption, income changes, and heterogeneity: evidence from two fiscal stimulus programs. Am. Econ. J. 6 (4), 84–106.

Montenovo, L., Jiang, X., Rojas, F.L., Schmutte, I.M., Simon, K.I., Weinberg, B.A., Wing, C., 2020. Determinants of Disparities in COVID-19 Job Losses. NBER Working Paper Series No. 27132.

Nygaard, V.M., Sørensen, B.E., Wang, F., 2020. Optimal Allocation of the COVID-19 Stimulus Checks. CEPR Discussion Paper Series No. DP15283.

OECD, 2020. Supporting Livelihoods During the COVID-19 Crisis: Closing the Gaps in Safety Nets. OECD Policy Responses to Coronavirus (COVID-19) 27080676.

Parker, J.A., Souleles, N.S., Johnson, D.S., McClelland, R., 2013. Consumer spending and the economic stimulus payments of 2008. Am. Econ. Rev. 103 (6), 2530–2553.

del Rio-Chanona, R.M., Mealy, P., Pichler, A., Lafond, F., Farmer, D., 2020. Supply and demand shocks in the COVID-19 pandemic: an industry and occupation perspective. Covid Econ. 6, 65–103.

Shapiro, M.D., Slemrod, J., 2003. Consumer response to tax rebates. Am. Econ. Rev. 93 (1), 381–396.

Shapiro, M.D., Slemrod, J., 2009. Did the 2008 tax rebates stimulate spending? Am. Econ. Rev. 99 (2), 374–379.

Sheridan, A., Andersen, A.L., Hansen, E.T., Johannesen, N., 2020. Social distancing laws cause only small losses of economic activity during the COVID-19 pandemic in scandinavia. Proc. Natl. Acad. Sci. 117 (34), 20468–20473.

Shimizutani, S., 2006. Consumer response to the 1998 tax cut: is a temporary tax cut effective? J. Jpn. Int. Econ. 20 (2), 269–287.

Watanabe, T., 2020. The Responses of Consumption and Prices in Japan to the COVID-19 Crisis and the Tohoku Earthquake. CJEB Working Papers Series No.373.

Watanabe, T., Yabu, T., 2020. Japan's Voluntary Lockdown. CJEB Working Papers Series No.375.